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Application No. 10/816,228
Preliminary Amendment

Amendments To The Specification

Please replace the paragraph beginning on page 2, line 2 in the application as filed with the following amended paragraph:

This application is a continuation-in-part of U.S. Patent Application No. 10/814,598, filed March 30, 2004, to Chaves et al., entitled OPTICAL DEVICE FOR LED-BASED LAMP, which claims the benefit under 35 U.S.C §119(e) of both provisional Application No. 60/470,691, filed May 13, 2003, to Miñano, entitled OPTICAL DEVICE FOR LED-BASED LIGHT-BULB SUBSTITUTE, and provisional Application No. 60/520,951, filed November 17, 2003, to Falicoff et al., entitled COLOR-MIXING COLLIMATOR, ~~which is~~ each being incorporated herein by reference in ~~[[its]]~~ their entirety, and this application is a continuation-in-part of U.S. Patent Application No. 10/461,557, filed June 12, 2003, to Miñano, et al., entitled OPTICAL DEVICE FOR LED-BASED LIGHT-BULB SUBSTITUTE, which claims the benefit under 35 U.S.C §119(e) of provisional Application No. 60/470,691, filed May 13, 2003, to Miñano, entitled OPTICAL DEVICE FOR LED-BASED LIGHT-BULB SUBSTITUTE, each being incorporated herein by reference in their entirety.

Please delete the paragraph beginning on page 2, line 6 in the application as filed, which begins with:

The present embodiments may be further understood

Please add the following paragraphs describing FIGS. 50-56 after the description of FIGS. 49a and 49b on page 8 starting at line 30:

FIG. 50 depicts a side view of the faceted virtual filament of FIGS. 49a and 49b and a rectangularly cut collimating totally internally reflecting (TIR) lens focused on its output section.

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FIGS. 51-53 depicts perspective views of the faceted virtual filament and the rectangularly cut collimating TIR lens of FIG. 50 as seen from three different angles.

FIG. 54 shows a perspective view of a plurality of the faceted virtual filament and collimating TIR lenses of FIG. 50 cooperated in a row.

FIG. 55 shows a luminaire for a row shown in FIG. 54.

FIG. 56 shows an alternative virtual filament cooperated with a TIR lens.

Please add the following paragraphs after the first full paragraph on page 27 starting at line 13:

FIG. 50 is a side view showing TIR lens 5030 with its focus at output section 751 of faceted virtual filament 750.

FIG. 51 is a view from below also showing faceted virtual filament 750, LED package 755, and TIR lens 5030, the latter comprising facets 5031 and flat cut-out planes 5032.

FIG. 52 shows the rectangular shape of TIR lens 5030, positioned above faceted virtual filament 750. Also shown is LED package 755 coupled to the bottom of virtual filament 750. There are four mounting feet 5013, somewhat smaller than the two shown in FIG. 49A, so as not to leak a greater amount of light from LED 755.

FIG. 53 is a perspective view from above showing virtual filament 750 and LED package 755. Rectangularly cut TIR lens 5030 has planar side walls 5032 and slightly indented upper surface 5033.

FIG. 54 shows lens 5040 comprising a row of rectangular TIR lenses 5030, and endmost virtual filament 750.

FIG. 55 shows endmost virtual filament 750 and circuit board 5050 upon which it is mounted. Sidewalls 5055 hold row lens 5040, flat holographic diffuser 5060 just above it, and outer cover 5070, which is optionally a holographic diffuser.

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Transverse arrow 5061 shows the long axis of the elliptical pattern of holographic diffuser 5060. Longitudinal arrow 5071 shows the long axis of the elliptical pattern of a holographic diffuser deployed on cover 5070. These diffusers cause a distant viewer to see a narrow line of light on cover 5070. It will have the color of the metameric resultant of the component colors mixed by faceted virtual filament 750.

FIG. 56 shows an alternative virtual filament configuration. Reflector cup 5061 is analogous to reflector cup 21 of FIG. 49B, in that it contains the system's light-emitting chips. Six-fold compound parabolic concentrator (CPC) section 5062 widens to hexagonal rod 5063. This CPC section can alternatively be a combination of an equiangular and a parabolic curve, hereinafter referred to as an equiangular-spiral concentrator, to avoid leakage. At the top of rod 5063, another parabolic (or equiangular spiral) section 5064 narrows the rod again. This widens the angular swath of light from the range of guided angles, about $\pm 48^\circ$, to about the full $\pm 90^\circ$ of LED package 755. Other even-polygon cross sections for the rod can also be used. Connected to rod 5063 is hemispheric lens 5065, positioned just under rectangular TIR lens 5066 and delivering light thereinto. Sections 5062, 5063, 5064 and 5065 can, in some embodiments, be formed all of one piece of transparent plastic, such as acrylic or polycarbonate. Light received into section 5062 is mixed by section 5063 and emitted out section 5065 into collimating lens 5066.